

## Upper Cretaceous Foraminifera from Japan

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IN THIS PAPER the discovery in Japan of smaller Foraminifera from the Upper Cretaceous strata is recorded for the first time. This contribution, in addition to its specific biostratigraphic application in Japan, has further interest by reason of its extension of the geographic range of the widely distributed Cretaceous pelagic foraminiferan, *Globotruncana*. In the north Pacific region, *Globotruncana* has heretofore been known only from the East Indian archipelago and from California.

This paper forms part of a project initiated by the Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, for the purpose of assembling paleontologic data applicable to solution of stratigraphic problems connected with exploration for oil and coal in Japan. In the course of the geological survey connected with oil exploration in the Cretaceous areas of Hokkaido, Mr. S. Iijima of the Geological Survey of Japan collected samples in 1947 from the Upper Cretaceous rocks in the vicinity of Nakagawa-mura, Nakagawa-gun, Teshio district, Hokkaido, which, on examination, proved to contain a few specimens of *Globotruncana*. This identification was confirmed by Dr. Paul P. Goudkoff of Los Angeles, California, in a letter dated April 29, 1948. He identified *Globotruncana canaliculata* (Reuss) and species of *Gyroidina* and *Pleurostomella* in the sample. Subsequent study at Tohoku University of additional rock samples from the Upper Cretaceous of Hokkaido has revealed that although the occurrence of *Globotruncana* seems to be rare in the Absehinai

area of the Teshio district of Hokkaido, *Bathysiphon*, *Glomospira*, and *Ammodiscoides* are commonly found.

In a well which was drilled recently to test for coal seams at Yokouchi, about 2.5 km. south of Hisanohama-machi, Futaba-gun, Fukushima Prefecture (Lat. 37° 7' N, Long. 141° 00' E), on the island of Honshu, the assemblage described in this paper was discovered in cores from 187 to 215 meters. The presence of Upper Cretaceous rocks in this general area was already known from the work of Tokunaga and Shimizu (1926), who recorded *Trigonia*, *Inoceramus*, and ammonites, indicative of Senonian age. In the core samples, from the well at Yokouchi, which consist of carbonaceous sandstones and shales, *Trigonia*, *Inoceramus*, and fragments of ammonites were found from 70 to 215 meters.

The Foraminifera identified from the cores between 187 and 215 meters in the Yokouchi well are:

- Silicosigmoilina futabaensis*, n.sp.—dominant
- Globotruncana canaliculata* (Reuss)—dominant
- Globotruncana marginata* (Reuss)—rare
- Globotruncana* sp.—rare
- Anomalina fukushimaensis*, n.sp.—dominant
- Trochammina hisanobamaensis*, n.sp.—few
- Robulus lepidus* (Reuss)—few
- Robulus futabaensis*, n.sp.—rare
- Robulus* sp.—few
- Marginulina cretacea* Cushman—rare
- Dentalina* cf. *basiplanata* Cushman—rare
- Dentalina* sp.—rare
- Vaginulina* cf. *lata* (Cornuel)—rare
- Palmula suturalis* (Cushman)—rare
- Ellipsonodosaria* sp.—rare

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Both the dominant genera of this assemblage, *Globotruncana* and *Silicosigmoilina*, are recorded from Japan for the first time. Their range in Europe and North America is restricted to Upper Cretaceous formations. Several of the species recorded are widely distributed in the Upper Cretaceous strata of other regions, and four are described as new. *Silicosigmoilina futabaensis* occupies a position in the Japanese assemblage comparable to that of *S. californica* in the Upper Cretaceous of California. *Globotruncana canaliculata* is found in abundance in Europe and the Gulf Coast region of the United States, but more rarely in California.

The writer is indebted to Lt. Col. Hubert G. Schenck, chief of Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, and professor of geology at Stanford University, California, under whose supervision and encouragement the present investigation was conducted; to Mr. Leo. W. Stach, head of the Petroleum Branch, Natural Resources Section, who was responsible for editing the manuscript; to the Hisanohama Coal Mining Co., which offered the core samples for study; to Dr. K. Hatai, Tohoku University, for advice and assistance during the investigation.

All specimens described herein are deposited in the collection of the Institute of Geology and Paleontology, Tohoku University, Sendai, Japan. Catalogue numbers of registered specimens are indicated in the text by the prefix IGPS.

#### Family SILICINIDAE

Genus SILICOSIGMOILINA Cushman and Church, 1929

*Silicosigmoilina futabaensis* Asano, n.sp.

Pl. 1, Figs. 6a, b; 7a, b

Test compressed, oval in side view, periphery subacute; chambers planispiral in earlier and sigmoidal in later stages; sutures indistinct, but fairly well marked between later

chambers, not deeply depressed; wall finely arenaceous, firmly cemented with siliceous cement; aperture simple, without a tooth; white or light gray in color. Length to 0.7 mm.; breadth 0.5–0.3 mm.; thickness 0.2–0.3 mm.

*Holotype*: IGPS 67016.

This species is related to *Silicosigmoilina californica* Cushman and Church, a species found abundantly in the Upper Cretaceous of California, but the Japanese species has a more compressed test.

#### Family TROCHAMMINIDAE

Genus TROCHAMMINA Parker and Jones, 1859

*Trochammina hisanohamaensis* Asano, n.sp.

Pl. 1, Figs. 8a–c

Test much compressed, planoconvex, dorsal side flat; ventral side slightly convex, umbilicate; chambers 4 or 5 in last coil, earlier chambers indistinct; sutures indistinct except for later ones which are somewhat depressed; wall finely arenaceous, smooth. Diameter to 0.6 mm.

*Holotype*: IGPS 67017.

*Trochammina texana* Cushman and Waters, from the Upper Cretaceous of the Gulf Coast region, is similar to this new species, but has less depressed sutures and the chambers have no raised borders.

#### Family LAGENIDAE

Genus ROBULUS Montfort, 1808

*Robulus futabaensis* Asano, n.sp.

Pl. 1, Figs. 12a, b

Test closely coiled, moderately compressed, periphery acute or with a slight keel; chambers distinct, of uniform shape and increasing gradually in size, 7 or 8 in adult coil; sutures distinct, gently curved, becoming thick and raised toward umbilical area; wall smooth;

aperture radiate with a weak slit ventrally. Diameter 1.2 mm.; thickness 0.4 mm.

*Holotype*: IGPS 67018.

This species differs from *Robulus williamsoni* (Reuss) in the presence of distinct raised sutures near the umbo.

***Robulus lepidus* (Reuss)**

Pl. 1, Fig. 13

*Robulus lepidus* Cushman and Church, 1929: 504, pl. 26, figs. 15, 16.

This species is said to be very common in the Upper Cretaceous rocks of Europe, California, and Mexico. The present specimens are identified with *Robulus lepidus* figured by Cushman and Church from the Upper Cretaceous of California.

***Robulus* sp.**

Pl. 1, Fig. 16

There are several incomplete specimens in the collection. The figured specimen has a distinct keel and an umbonate center, but

there is insufficient material for complete description.

**Genus MARGINULINA d'Orbigny, 1826**

***Marginulina cretacea* Cushman**

Pl. 1, Fig. 14

*Marginulina cretacea* Cushman, 1937: 94, pl. 13, figs. 12-15.

This species has been recorded from many localities in the Upper Cretaceous of the Gulf Coast region of the United States, but it is rare in the present collection.

**Genus DENTALINA d'Orbigny, 1826**

***Dentalina* cf. *basiplanata* Cushman**

Pl. 1, Fig. 11

*Dentalina basiplanata* Cushman, 1946: 68, pl. 24, figs. 1-6.

The apertural end is not preserved in any of the present specimens, although the limbate sutures are very characteristic as is shown in the figure. This species was originally described from the Corsicana Marl of Texas.

**EXPLANATION OF PLATE**

FIGS. 1a-c; 3a-c. *Globotruncana canaliculata* (Reuss).  $\times 40$ . a, Dorsal aspect; b, peripheral aspect; c, ventral aspect.

FIGS. 2a-c; 4a-c. *Globotruncana marginata* (Reuss).  $\times 40$ . a, Dorsal aspect; b, peripheral aspect; c, ventral aspect.

FIGS. 5a-c. *Globotruncana* sp.  $\times 45$ . a, Dorsal aspect; b, peripheral aspect; c, ventral aspect.

FIGS. 6a, b; 7a, b. *Silicosigmoilina futabaensis* Asano, n.sp.  $\times 40$ . a, Lateral aspect; b, apertural aspect. (Fig. 6, holotype. Fig. 7, paratype.)

FIGS. 8a-c. *Trochammina hisanobamaensis* Asano, n.sp.  $\times 40$ . a, Ventral aspect; b, peripheral aspect; c, dorsal aspect. (Holotype.)

FIG. 9. *Palmula suturalis* (Cushman).  $\times 35$ .

FIG. 10. *Dentalina* sp.  $\times 40$ .

FIG. 11. *Dentalina* cf. *basiplanata* Cushman.  $\times 40$ .

FIGS. 12a, b. *Robulus futabaensis* Asano, n.sp.  $\times 40$ . a, Lateral aspect; b, apertural aspect. (Holotype.)

FIG. 13. *Robulus lepidus* (Reuss).  $\times 40$ .

FIG. 14. *Marginulina cretacea* Cushman.  $\times 40$ .

FIG. 15. *Ellipsonodosaria* sp.  $\times 40$ .

FIG. 16. *Robulus* sp.  $\times 40$ .

FIGS. 17a, b; 18a-c. *Anomalina fukushimaensis* Asano, n.sp.  $\times 40$ . 17a, Dorsal aspect; b, ventral aspect. 18a, Ventral aspect; b, apertural aspect; c, dorsal aspect. (Fig. 17, paratype. Fig. 18, holotype.)

FIG. 19. *Vaginulina* cf. *lata* (Cornuel).  $\times 45$ .

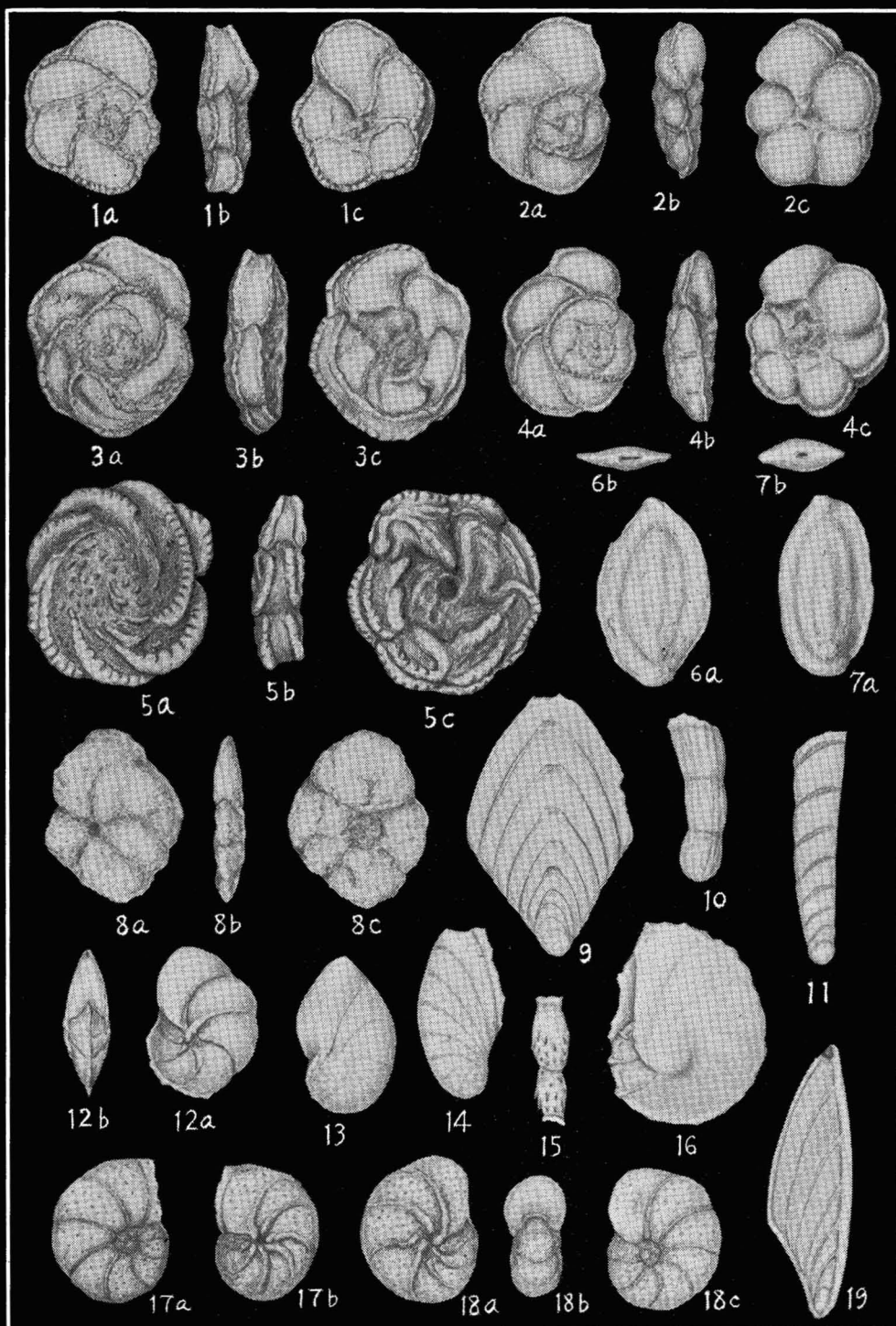


PLATE I  
Species of Foraminifera from the Upper Cretaceous strata of Japan.

**Dentalina** sp.

Pl. 1, Fig. 10

The single fragmentary specimen in the collection does not warrant description.

**Genus VAGINULINA** d'Orbigny, 1826**Vaginulina** cf. *lata* (Cornuel)

Pl. 1, Fig. 19

*Vaginulina lata* Cornuel, 1848: 252, pl. 1, figs. 34-37.

The single specimen figured is possibly the named species, but the inadequate material makes positive identification difficult.

**Genus PALMULA** Lea, 1833**Palmula** *suturalis* (Cushman)

Pl. 1, Fig. 9

*Flabellina suturalis* Cushman, 1935: 86, pl. 13, figs. 9-18.

*Palmula suturalis* Loetterle, 1937: 28, pl. 3, fig. 5.

The present specimens are very similar to those figured by both Cushman and Loetterle from the Upper Cretaceous of the Gulf Coast region of the United States.

**Family ELLIPSOIDINIDAE****Genus ELLIPSONODOSARIA** A. Silvestri, 1900**Ellipsonodosaria** sp.

Pl. 1, Fig. 15

The fragment of the spinose specimen figured resembles *Ellipsonodosaria horridens* Cushman, but the specimens are insufficient for specific identification.

**Family GLOBOROTALIIDAE****Genus GLOBOTRUNCANA** Cushman, 1927**Globotruncana** *canaliculata* (Reuss)

Pl. 1, Figs. 1a-c, 3a-c

*Globotruncana canaliculata* Cushman, 1946: 149, pl. 61, figs. 17, 18.

The present species is abundant and very characteristic of the Upper Cretaceous of Europe and America and is found commonly in the present collection. The type of this species is from the Senonian of Europe. There is considerable variation in the shape of the chambers. The nearly parallel faces and truncate periphery are characteristic features of this species. The present specimens are similar to the typical one figured by Cushman from Bavaria.

**Globotruncana** *marginata* (Reuss)

Pl. 1, Figs. 2a-c, 4a-c

*Globotruncana marginata* Cushman, 1946: 150, pl. 62, figs. 1, 2.

This species is found rarely in the present collection. The dorsal and ventral sides are difficult to distinguish from *G. canaliculata*, but the presence of a single keel or the tendency to have a truncate border in the later chambers of the peripheral side is a characteristic and distinguishing feature.

**Globotruncana** sp.

Pl. 1, Figs. 5a-c

This form differs from those described above in having strongly overlapped chambers with peculiar keels. Further material is needed for specific evaluation.

**Family ANOMALINIDAE****Genus ANOMALINA** d'Orbigny, 1826**Anomalina** *fukushimaensis* Asano, n.sp.

Pl. 1, Figs. 17a, b; 18a-c

Test planispiral, both sides convex, periphery broadly rounded; chambers distinct, 8 or 9 in last coil; sutures on dorsal side curved and limbate, but raised on ventral side, especially toward umbilical center; wall coarsely perforate except at umbilical region on ventral side; aperture an arched slit with a slight lip at base of last chamber. Diameter up to 0.5 mm.

*Holotype*: IGPS 67019.

This small species is similar to *Anomalina clementina* d'Orbigny in having raised ridges along the sutures, but is distinguished from that species by the more rounded periphery of the test.

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## News Notes

The following publications of the Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, have been received. Each report includes a list of all the reports previously published.

*Reconnaissance Soil Survey of Japan (Kyu-*

*shu Area)*. [by Robert E. O'Brien and E. J. Kohler.] Report No. 110-B. 73 pp., 12 figs., 12 tables, 10 maps.

*Japanese Whaling Industry Prior to 1946*. [by William M. Terry.] Report No. 126. 47 pp., 17 figs., 19 tables.